NDA-CDS 1 2025

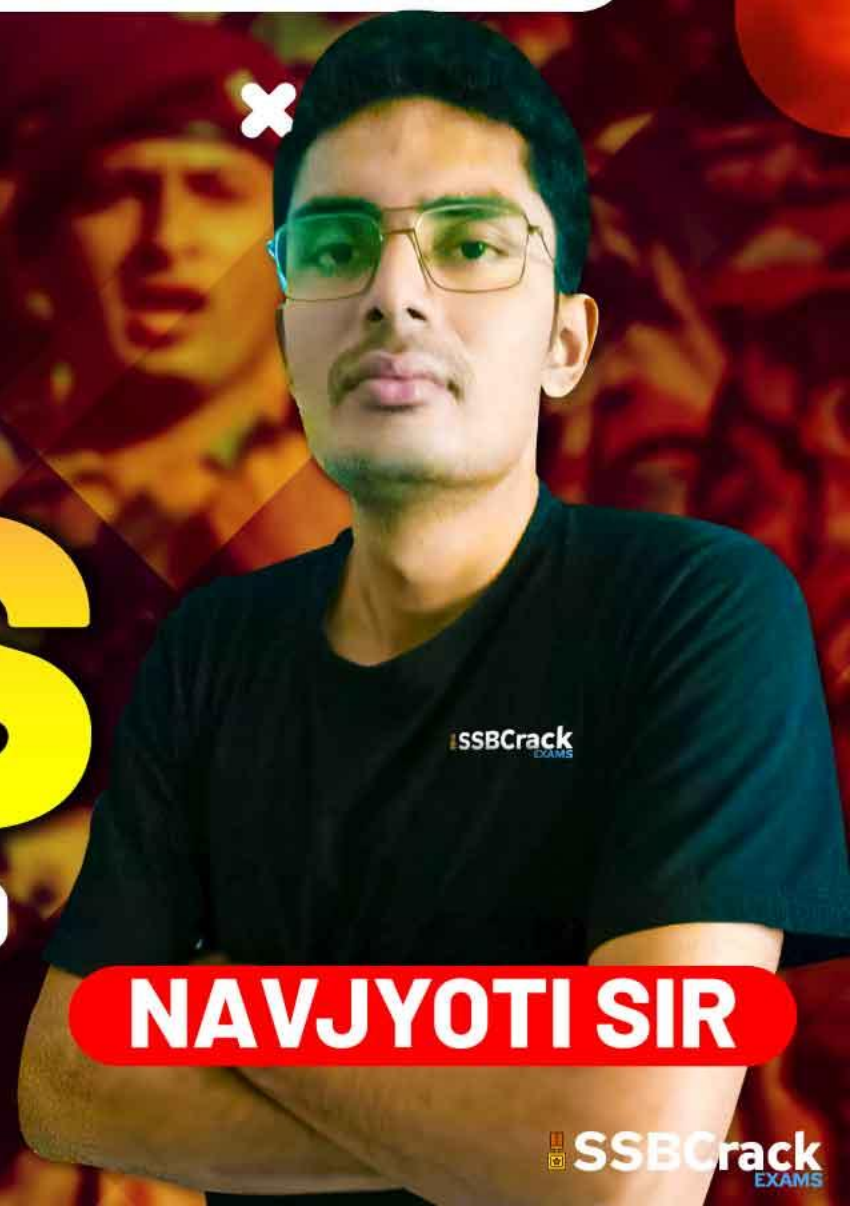
GS

LIVE

PHYSICS

HUMAN EYE & COLOURFUL WORLD

CLASS 1



NAVJYOTI SIR

SSBCrack EXAMS

04 Dec 2024 Live Classes Schedule

8:00AM	04 DEC 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	04 DEC 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF GD & LECTURETTE	ANURADHA MA'AM

NDA 1 2025 LIVE CLASSES

1:00PM	PHYSICS - HUMAN EYE & THE COLOURFUL WORLD - CLASS 1	NAVJYOTI SIR
4:30PM	ENGLISH - ADAPTATION OF BORROWED WORDS - CLASS 2	ANURADHA MA'AM
5:30PM	MATHS - DIFFERENTIABILITY & DIFFERENTIATION - CLASS 1	NAVJYOTI SIR

CDS 1 2025 LIVE CLASSES

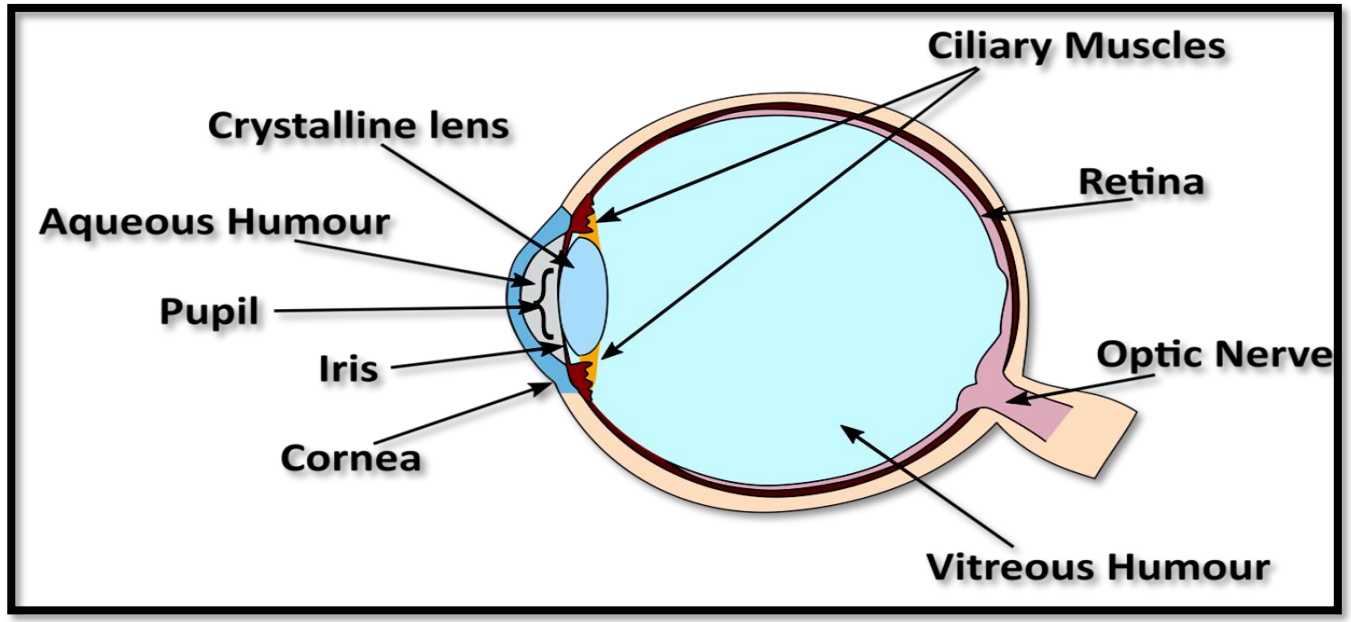
1:00PM	PHYSICS - HUMAN EYE & THE COLOURFUL WORLD - CLASS 1	NAVJYOTI SIR
4:30PM	ENGLISH - ADAPTATION OF BORROWED WORDS - CLASS 2	ANURADHA MA'AM
7:00PM	MATHS - ALGEBRA - CLASS 1	NAVJYOTI SIR

HUMAN EYE AND COLOURFUL WORLD

WHAT WILL WE STUDY ?

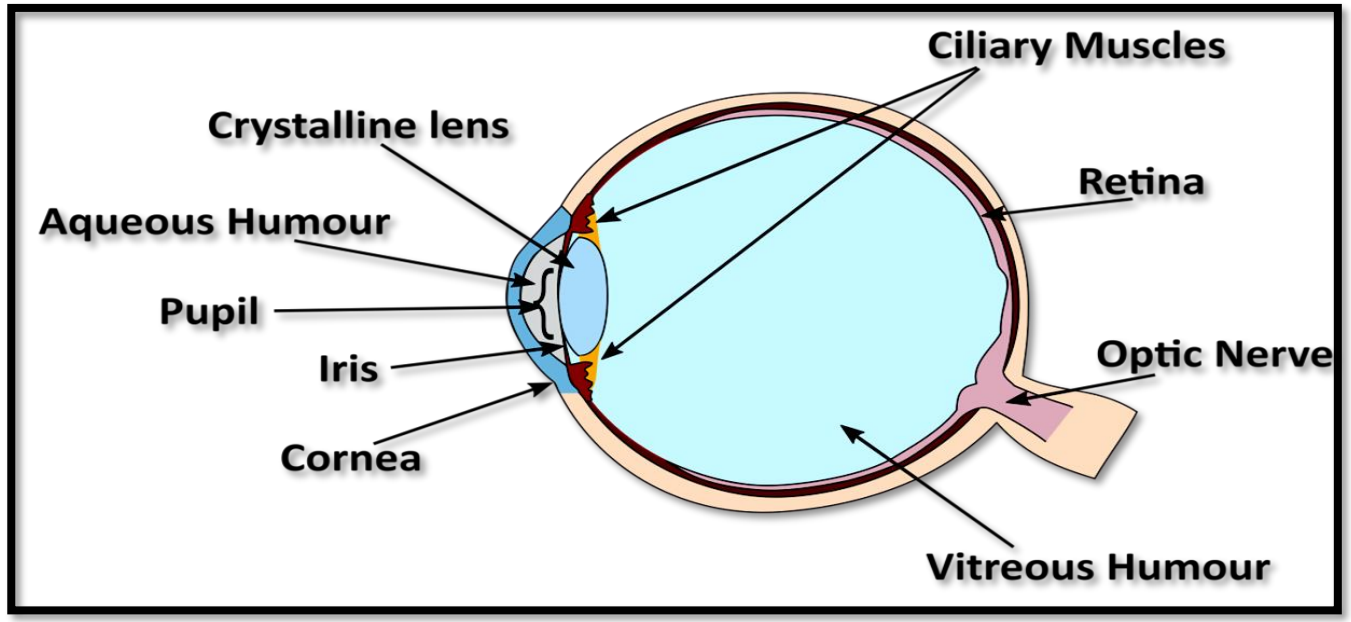
- Human Eye and its Parts
- Defects of Vision and Correction
- Prism – Refraction and Dispersion
- Scattering of Light
- Microscopes and Telescopes

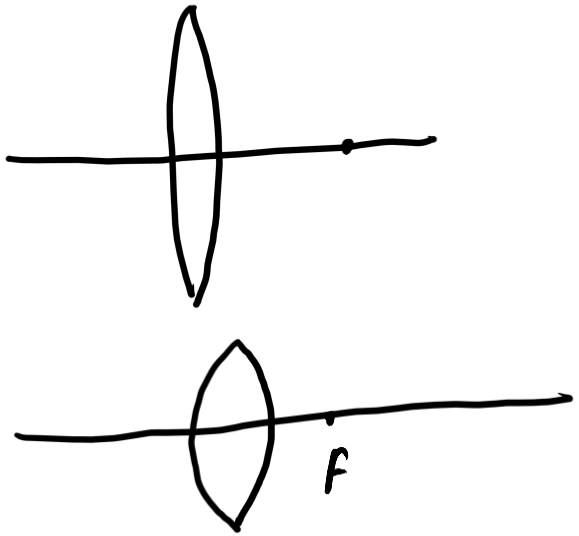
Human Eye and its Parts



- Cornea : Light enters the eye through this thin membrane. Most of the refraction for the light rays entering the eye occurs at the outer surface of the cornea.
- Pupil : It regulates and controls the amount of light.
- Iris : A dark muscular diaphragm controls the size of pupil.

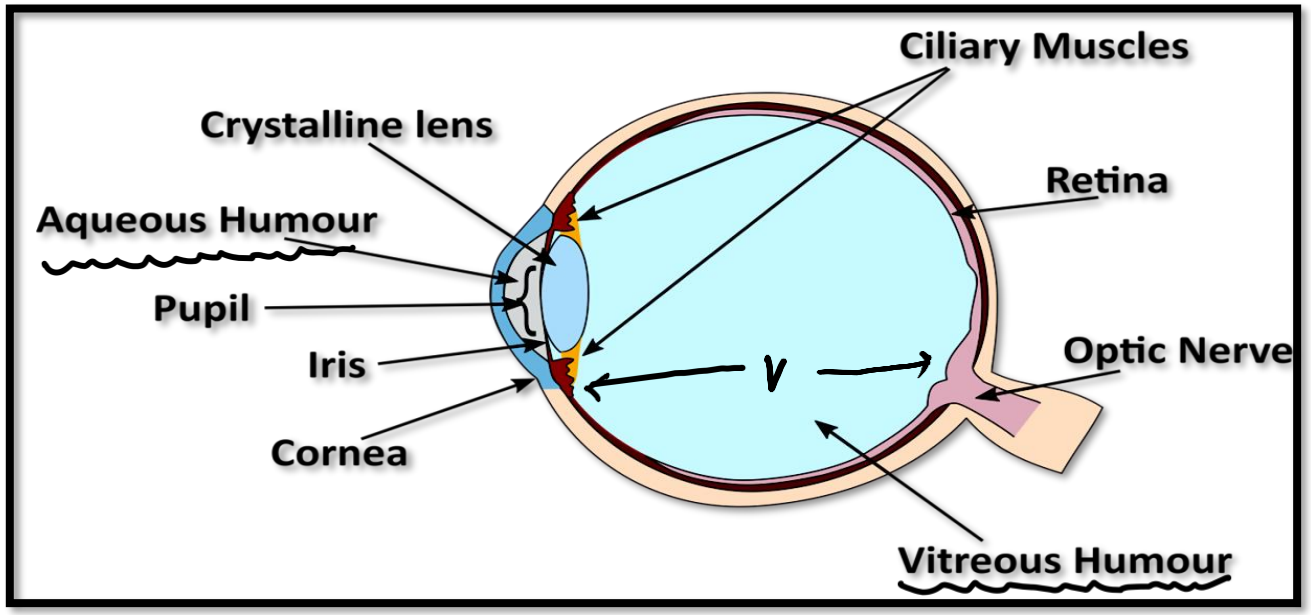
Human Eye and its Parts





- **Crystalline Lens : A convex lens forming a real and inverted image ; provides the finer adjustment of focal length required to focus objects at different distances on the retina.**
- **Ciliary Muscles : They hold the lens in position and help in modifying the curvature of the lens.**

Human Eye and its Parts



- **Retina :** It is the light sensitive surface of eye on which the image is formed. It contains light sensitive cells rods and cones.
- **Optic Nerve :** It transmits visual information from the retina to the brain.

image distance (v) is fixed.

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

If u is varying and v is fixed, then f has to be adjust.

TERMS RELATED TO HUMAN EYE

(#)

- **Power of Accomodation : It is the ability of eye lens, to change its focal length to form sharp images of objects at different positions from the eye on the retina of the eye.**
- **Near Point : It is the nearest position of an object from human eye, so that its sharp images is formed on the retina.** (25 cm)
- **Range of vision : It is the distance between near point and the far point of an eye. For normal eye, the range of vision is 25 cm to infinity.**

near point far point

EYE DEFECTS

- Eye losing its power of accomodation and so causes refractive defects.

1. Myopia
2. Hypermetropia
3. Presbyopia

- Others :

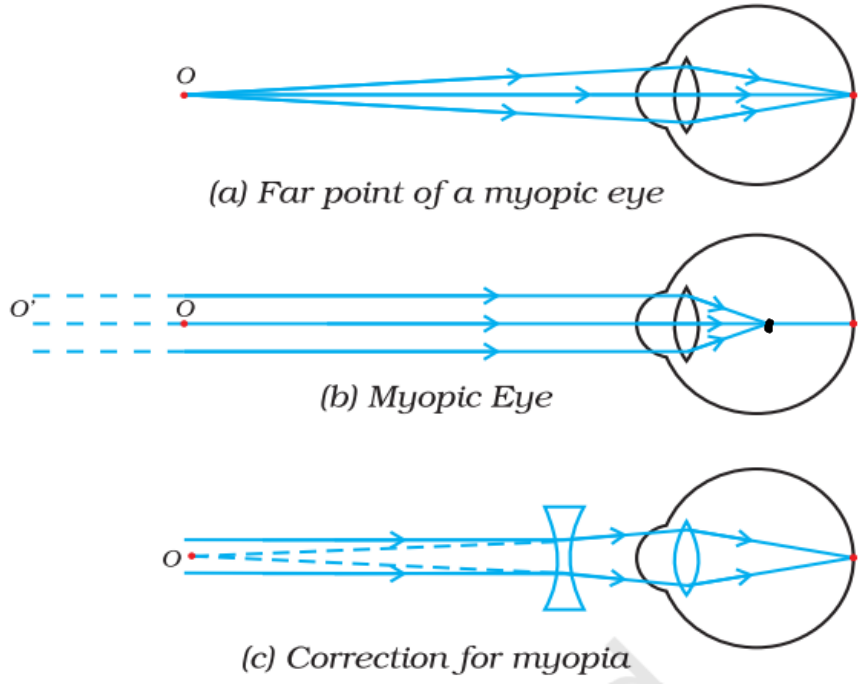
  Astigmatism ,

  Colour Blindness ,

  Cataract

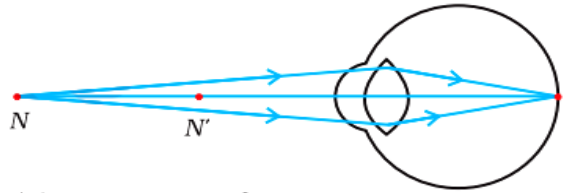
MYOPIA OR NEAR - SIGHTEDNESS

- A person may see clearly upto a distance of a few metres , as the far point has become nearer to infinity.
- In a myopic eye, the image of a distant objec is formed in front of the retina.
- This defect may arise due to
  (i) excessive curvature of the eye lens. ✓
  (ii) elongation of the eyeball. ✓
- This defect can be removed by using a concave lens of appropriate power.

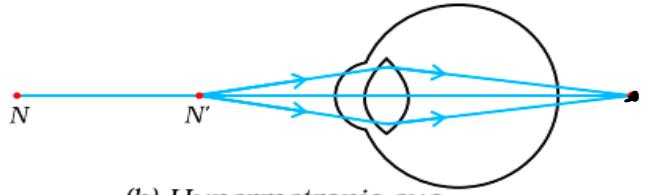


HYPERMETROPIA OR FAR - SIGHTEDNESS

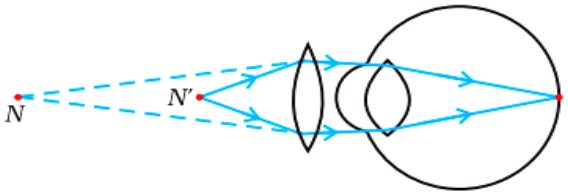
- A person can see far away objects but cannot see near by objects clearly.
- In this defect, the near point of eye shifts away from the eye.
- This defect arises either because
  (i) the focal length of the eye lens is too long, or
  (ii) the eyeball has become too small.
- This defect can be removed by using a convex lens of appropriate power.



(a) Near point of a Hypermetropic eye



(b) Hypermetropic eye

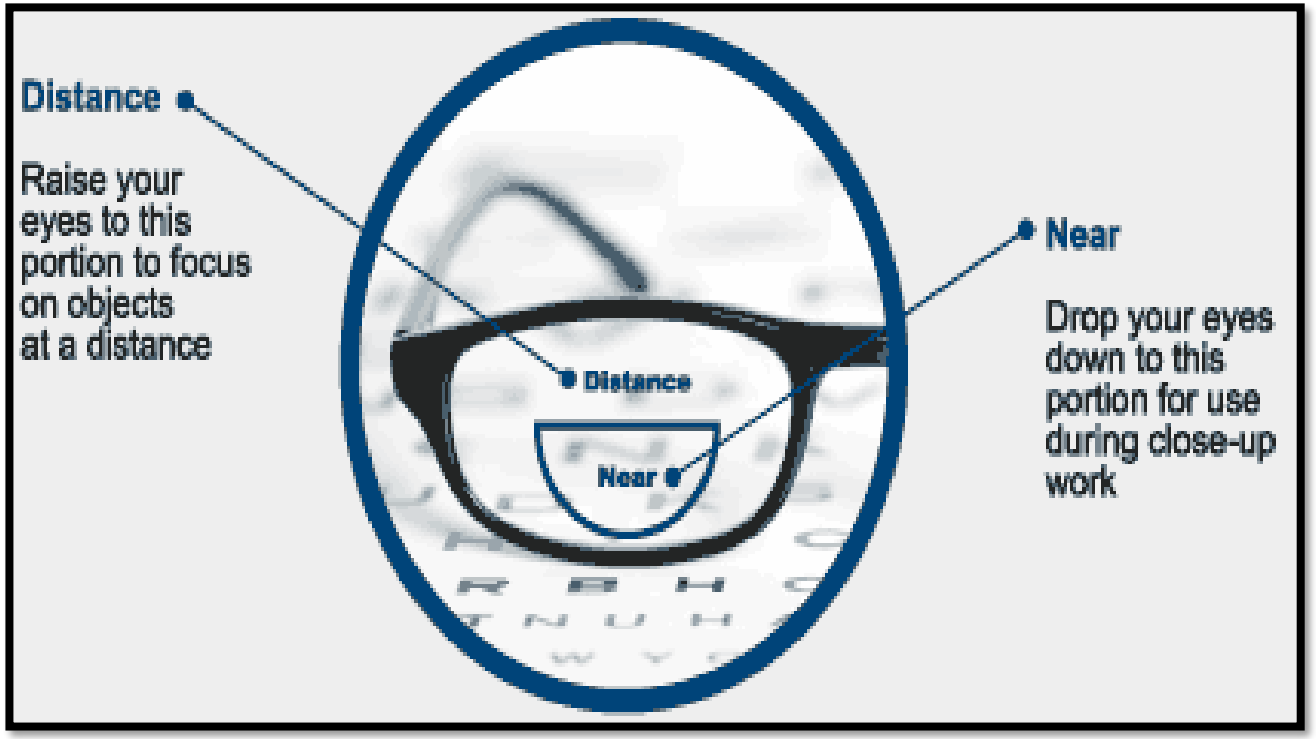


(c) Correction for Hypermetropic eye

PRESBYOPIA

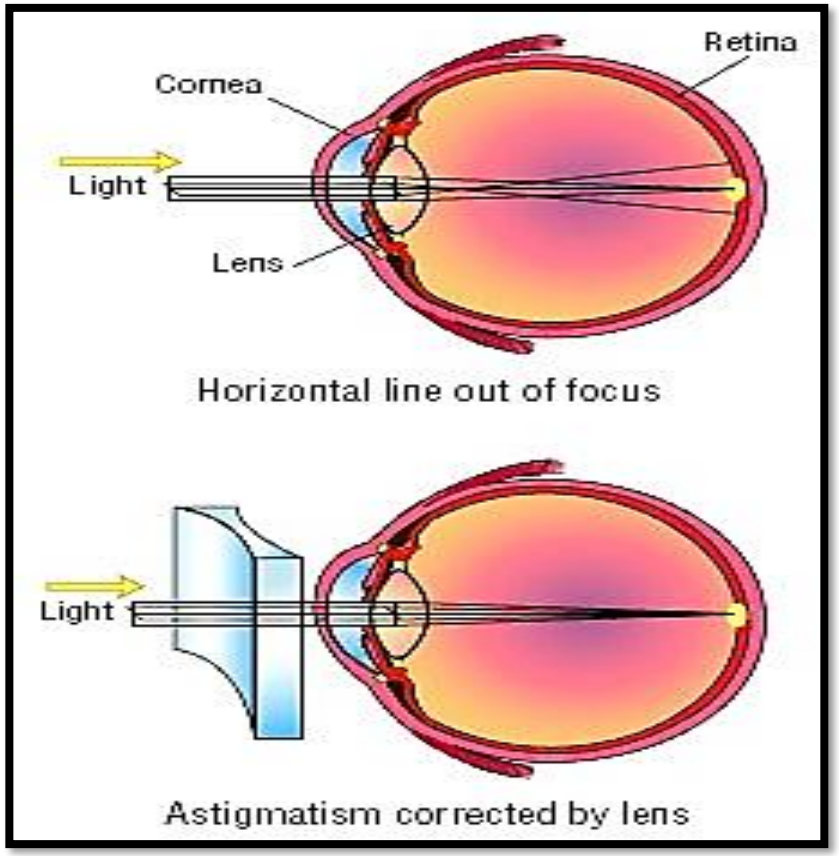
- The power of accommodation of the eye usually decreases with ageing. For most people, the near point gradually recedes away. They find it difficult to see nearby objects comfortably.
- It arises due to the gradual weakening of the ciliary muscles and diminishing flexibility of the eye lens.
- Sometimes, a person may suffer from both myopia and hypermetropia. Such people often require bi-focal lenses.

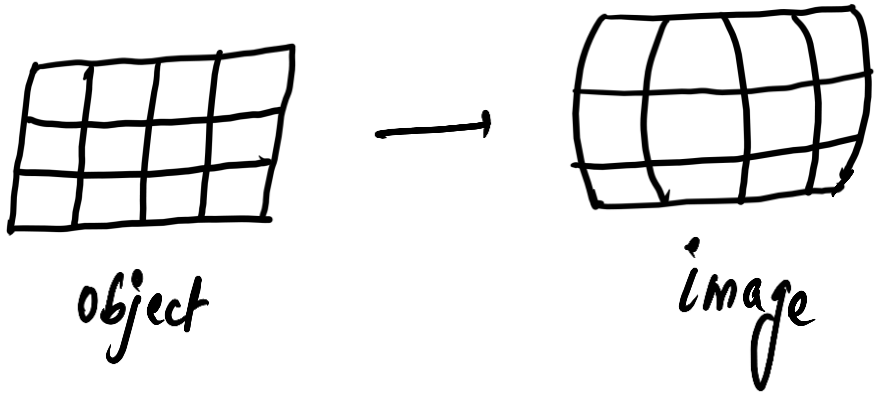
BIFOCAL LENS



OTHER EYE DEFECTS

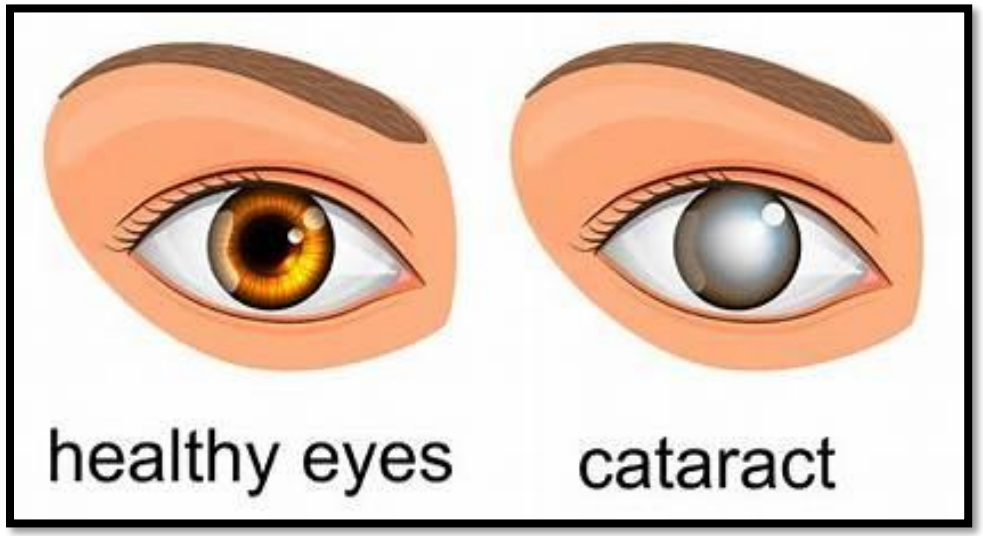
- Astigmatism : The defect in the eye or in a lens caused by a deviation from spherical curvature, which results in distorted images, as light rays are prevented from meeting at a common focus.
  - This defect can be removed by using suitable cylindrical lenses.





OTHER EYE DEFECTS

- Cataract : An opaque white membrane is developed on cornea due to which person loses power of vision partially or completely.
  - This defect can be removed by removing this membrane through surgery.



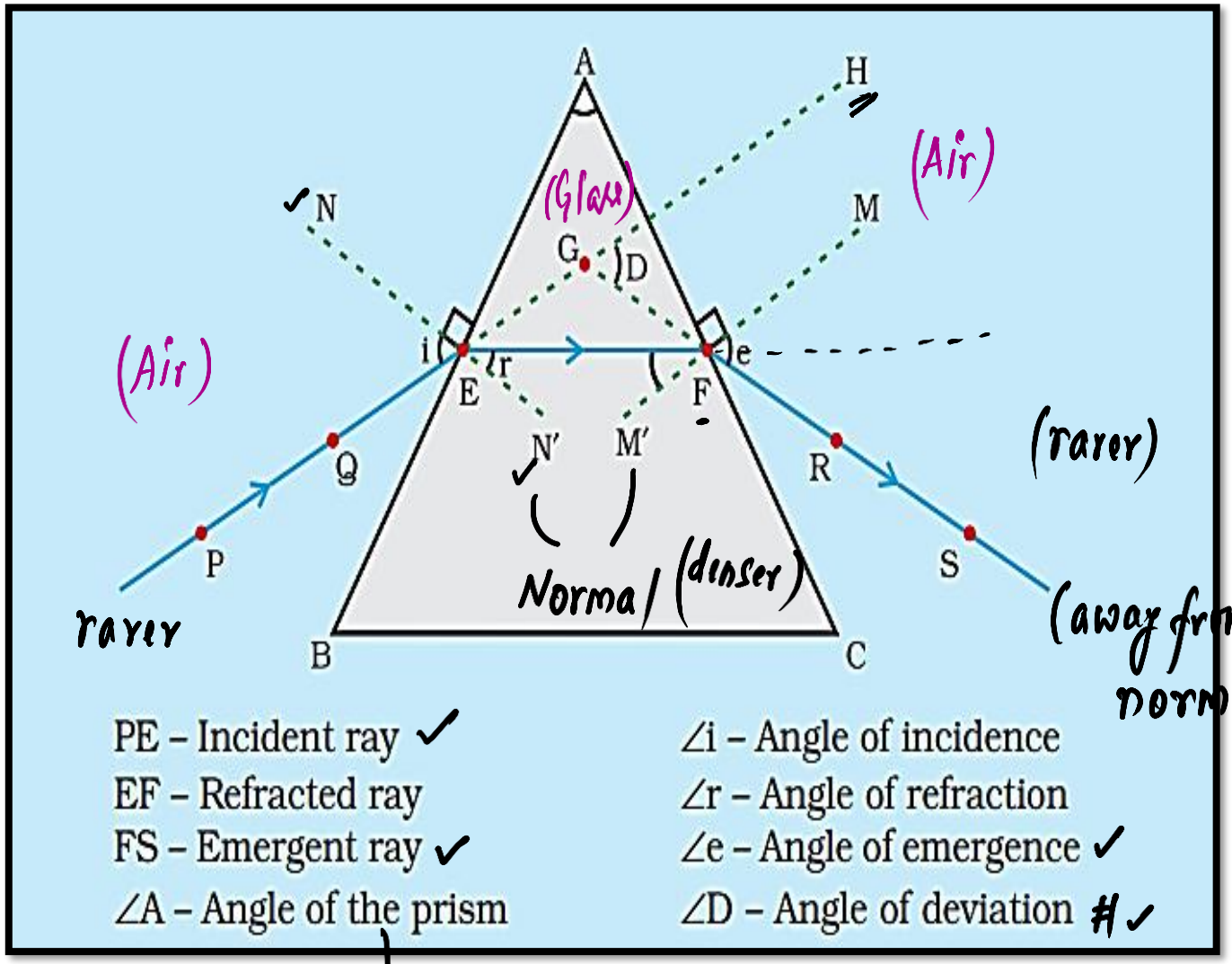
OTHER EYE DEFECTS

- **Colour Blindness : In this defect, a person is unable to distinguish between few colours.**
- **The reason of this defect is the absence of cone cells sensitive to those colours.**

Colour

* Cannot be corrected.

REFRACTION BY GLASS PRISM



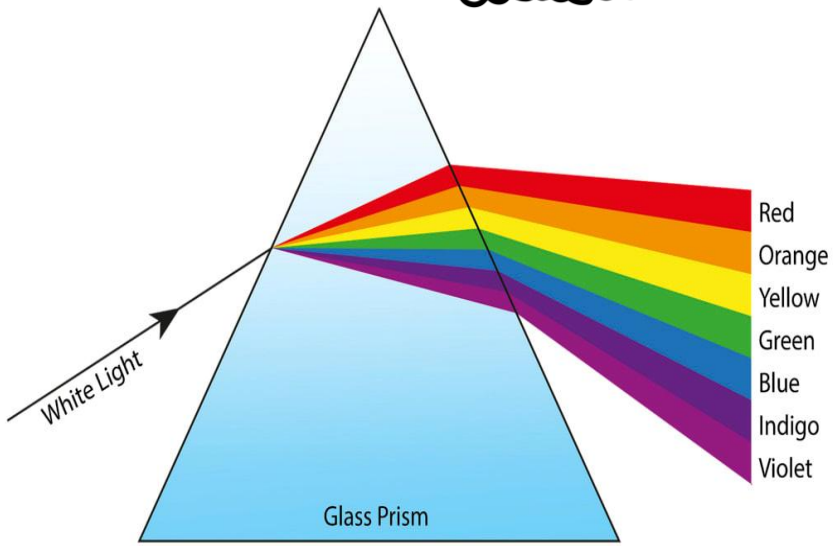
PE – Incident ray ✓
EF – Refracted ray
FS – Emergent ray ✓
∠A – Angle of the prism

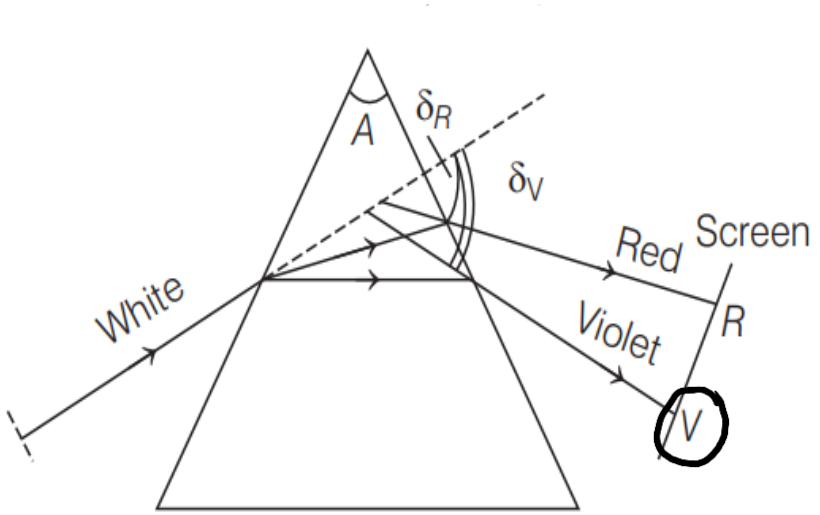
∠i – Angle of incidence
∠r – Angle of refraction
∠e – Angle of emergence ✓
∠D – Angle of deviation #✓

generally 60°

#DISPERSION

- **The splitting of white light into its constituent colours in the sequence of VIBGYOR, on passing through a prism.**





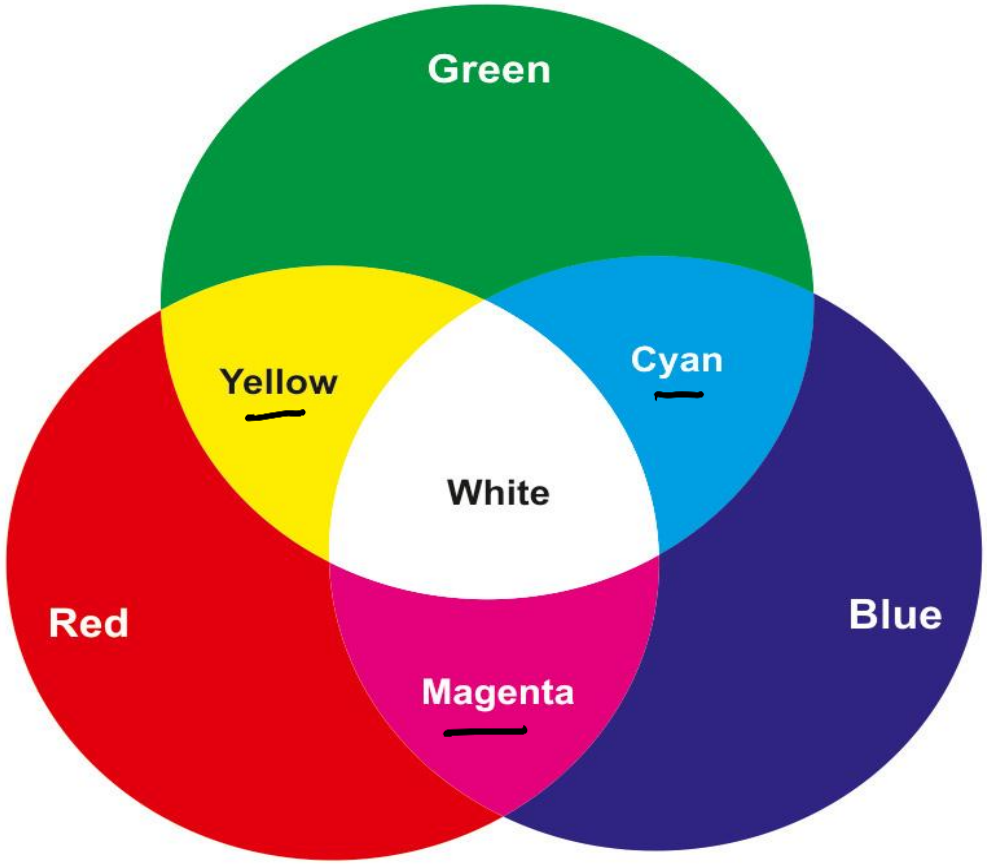
R O Y G B I V → increasing wavelength (λ)

(Deviation $\propto \frac{1}{\lambda}$)

$\mu_r \propto \lambda$

(in comparison to μ_{glass})

PRIMARY AND SECONDARY COLOURS



Red + Green = Yellow

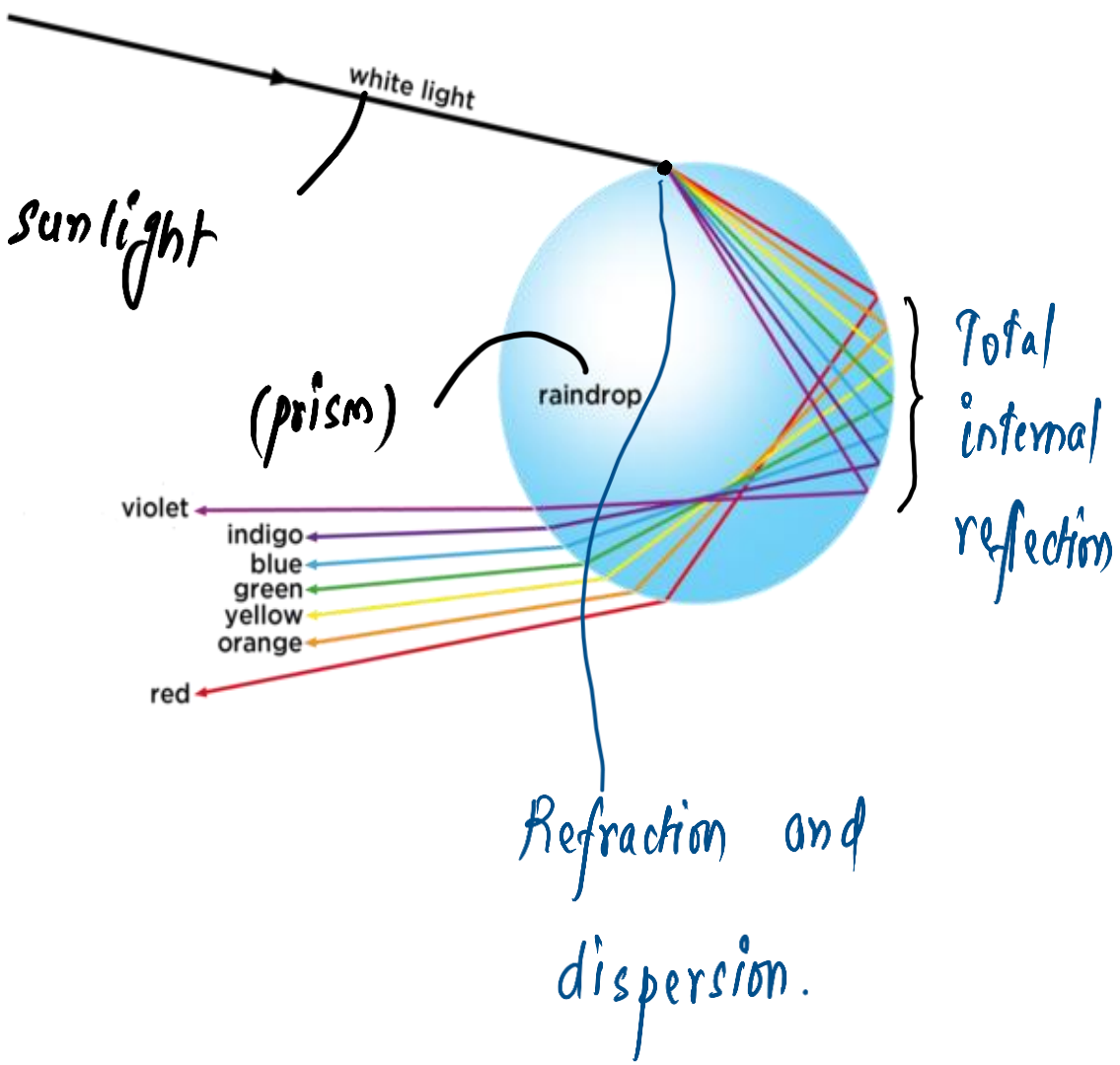
Green + Blue = Cyan

Blue + Red = Magenta

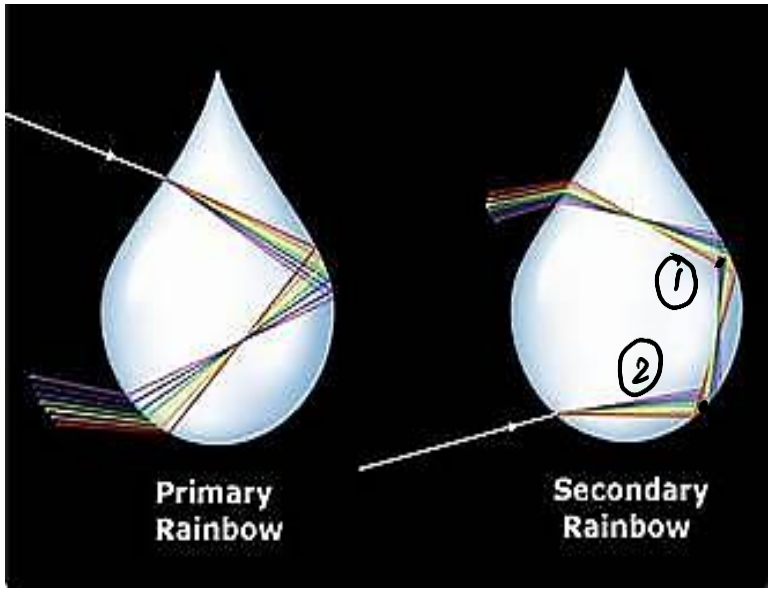
Primary — Red, Green, Blue } → mixing primary colours give secondary colours (Yellow, Cyan, Magenta)

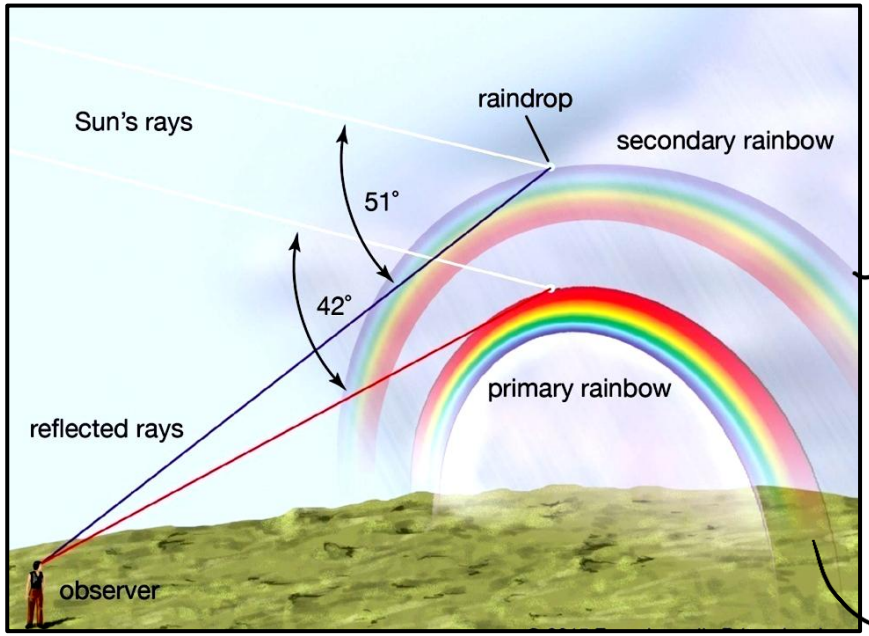
RAINBOW FORMATION

- Caused by dispersion of sunlight by tiny water droplets, present in the atmosphere.
- A rainbow is always formed in a direction opposite to that of the Sun.
- The water droplets act like small prisms.
- A rainbow can also be seen on a sunny day at the sky through a waterfall or through a water fountain, when the Sun is behind.



SECONDARY RAINBOW FORMATION





R O Y G B I V

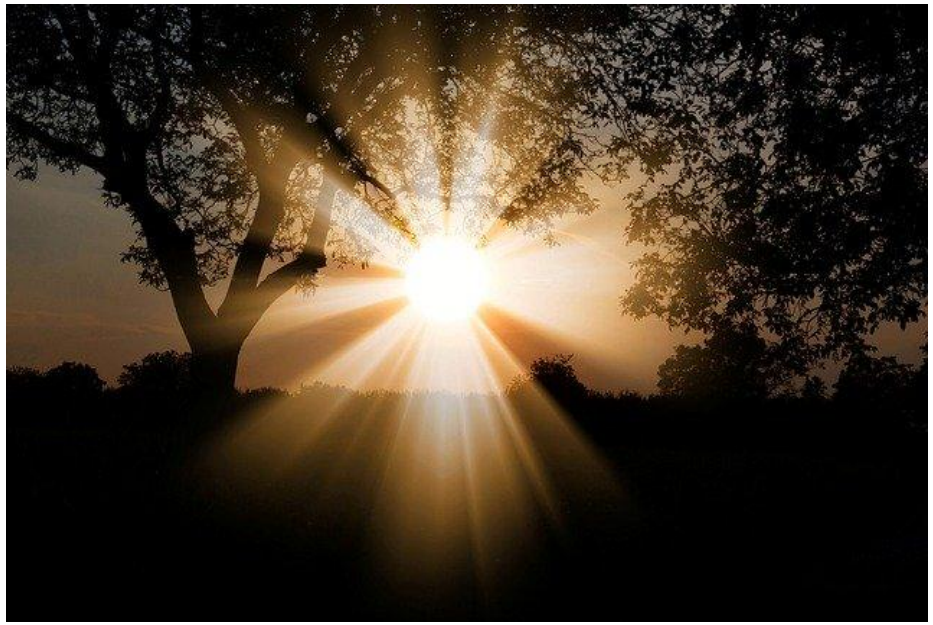
reverse

V I B G Y O R

- A secondary bow may be observed, which is considerably **less intense than the primary bow** and has its colour sequence reversed.
- It is seen outside of the primary bow. This bow results from light that has undergone **two internal reflections within the water drop**. ✓
- Higher-order rainbows, resulting from three or more internal reflections, are exceedingly weak and hence are rarely observed.

SCATTERING OF LIGHT

- When light passes through a medium in which particles are suspended whose size is of the order of wavelength of light, then , light on striking these particles gets deviated in different directions.



DAILY LIFE EXAMPLES OF SCATTERING OF LIGHT

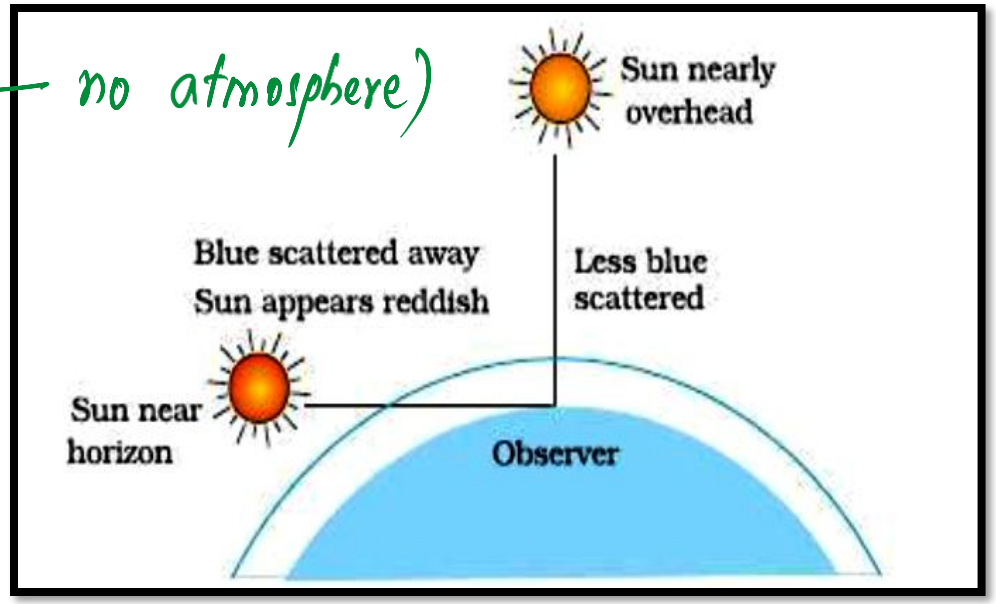
1. Blue colour of sky.
2. Red colour of sky at the time of sun rise and sun set.
3. Red colour of signals of danger.
4. White Colour of the clouds.
5. Sky appearing to be black when seen from space.

(RAYLEIGH SCATTERING)

amount of scattering $\propto \frac{1}{\lambda^2}$

(no scattering — no atmosphere)

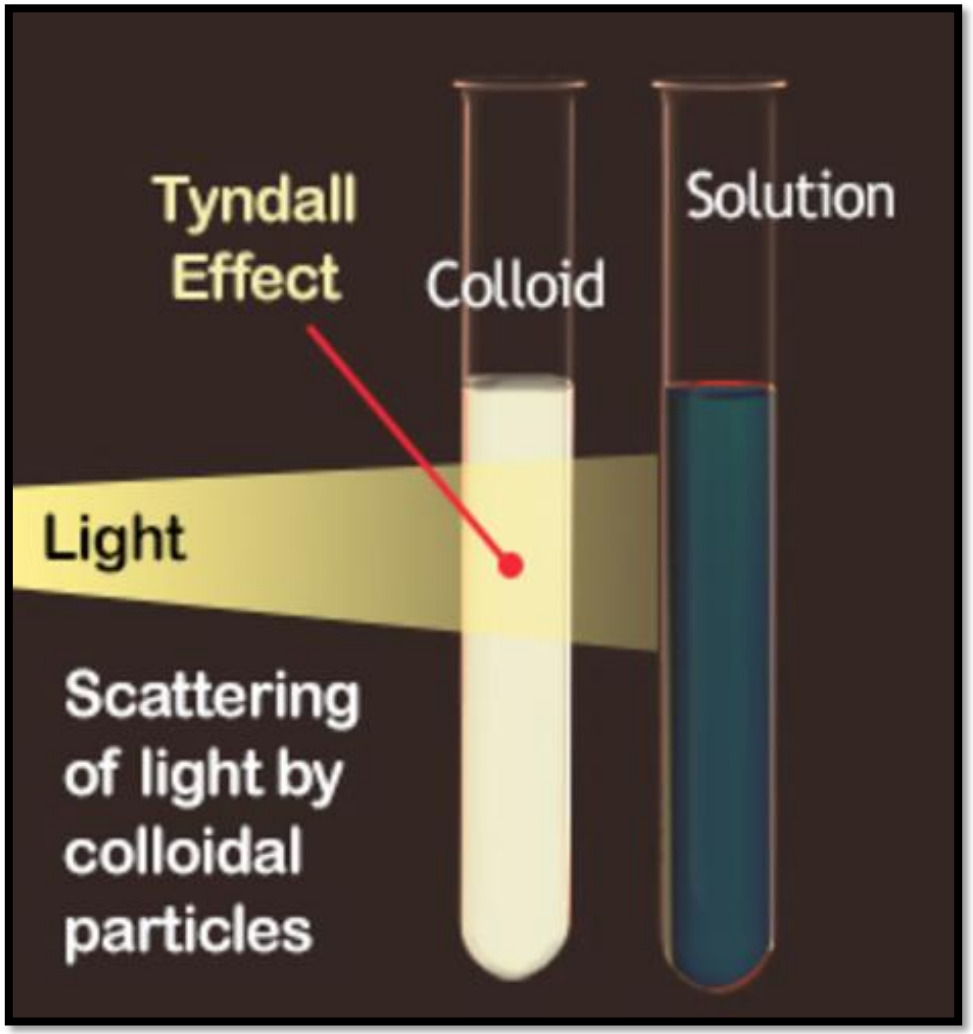
all colours are scattered equally.



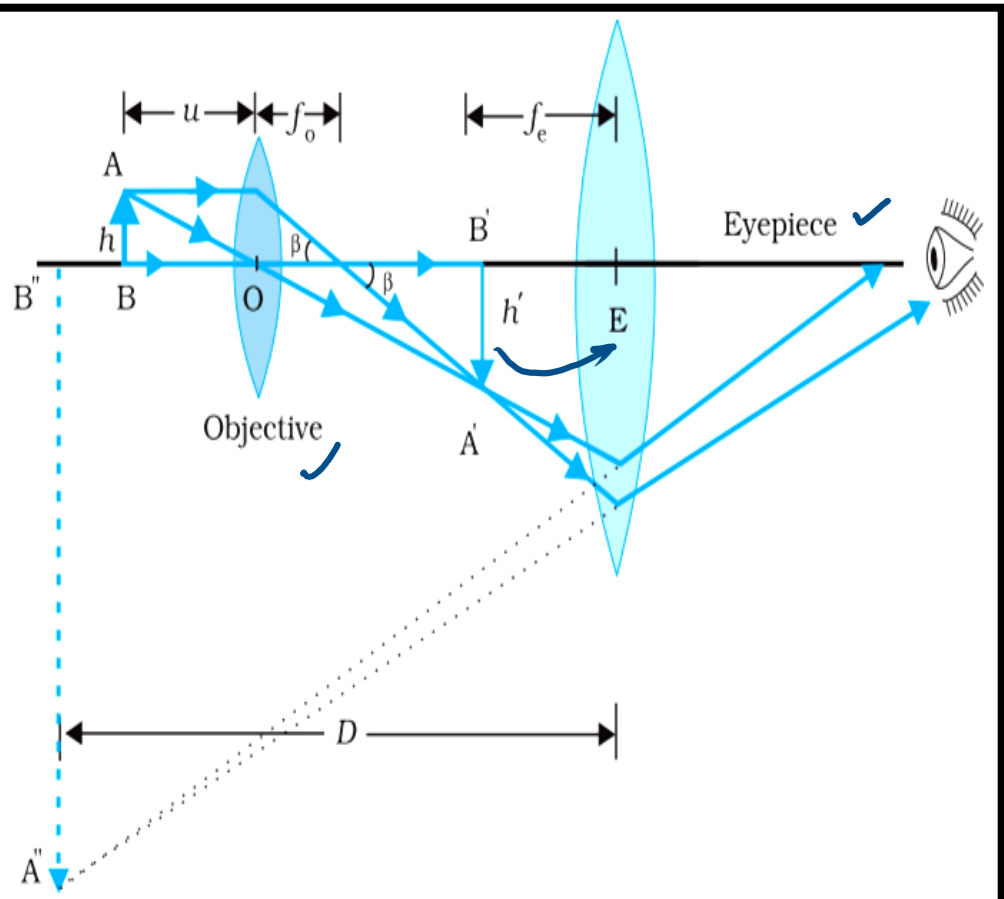
max. scattering

min. scattering

TYNDALL EFFECT



MICROSCOPE



Magnifying Power

(i) When final image is formed at least distance of distinct vision (D), then

$$M = \frac{v_o}{u_o}\left(1 + \frac{D}{f_e}\right)$$

where, v_o = distance of image formed by objective lens

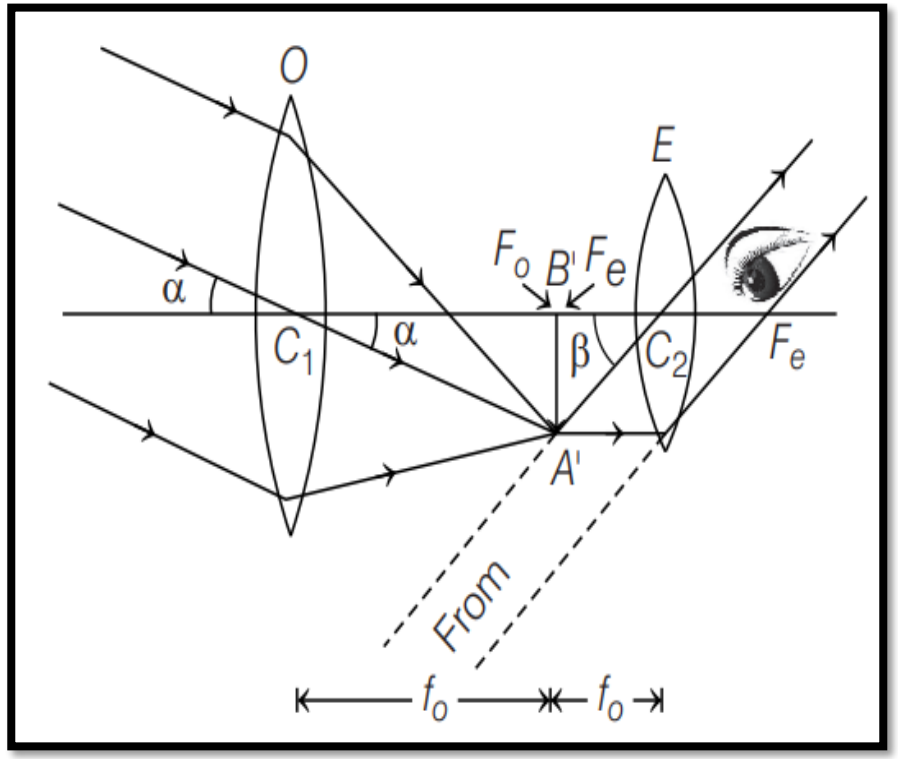
and u_o = distance of object from the objective.

(ii) When final image is formed at infinity, then, $M = \frac{v_o}{u_o} \cdot \frac{D}{f_e}$

$v_o = f_e$

TELESCOPE

1. Astronomical Telescope :



Magnifying Power

(i) When final image is formed at least distance of distinct vision (D), then $M = \frac{f_o}{f_e}\left(1 + \frac{D}{f_e}\right)$, where f_o and f_e are focal lengths of objective and eyepiece respectively.

Length of the telescope $(L) = (f_o + u_e)$

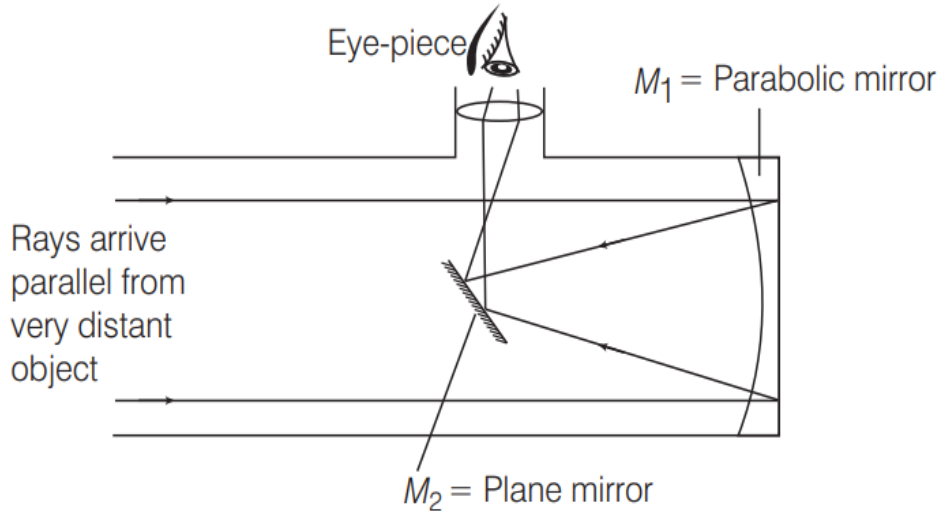
where, u_e = distance of object from the eyepiece.

(ii) When final image is formed at infinity, then $M = \frac{f_o}{f_e}$.

Length of the telescope, $(L) = f_o + f_e$

TELESCOPE

2. Reflecting Telescope



If f_0 is focal length of the concave spherical mirror and f_e the focal length of the eye-piece, the magnifying power of the reflecting telescope is given by

$$m = \frac{f_o}{f_e}$$

SUMMARY

- Human Eye and Parts
- Eye Defects and Correction
- Deviation and Dispersion by Glass Prism
- Scattering of Light and Examples in Nature
- Microscopes and Telescopes

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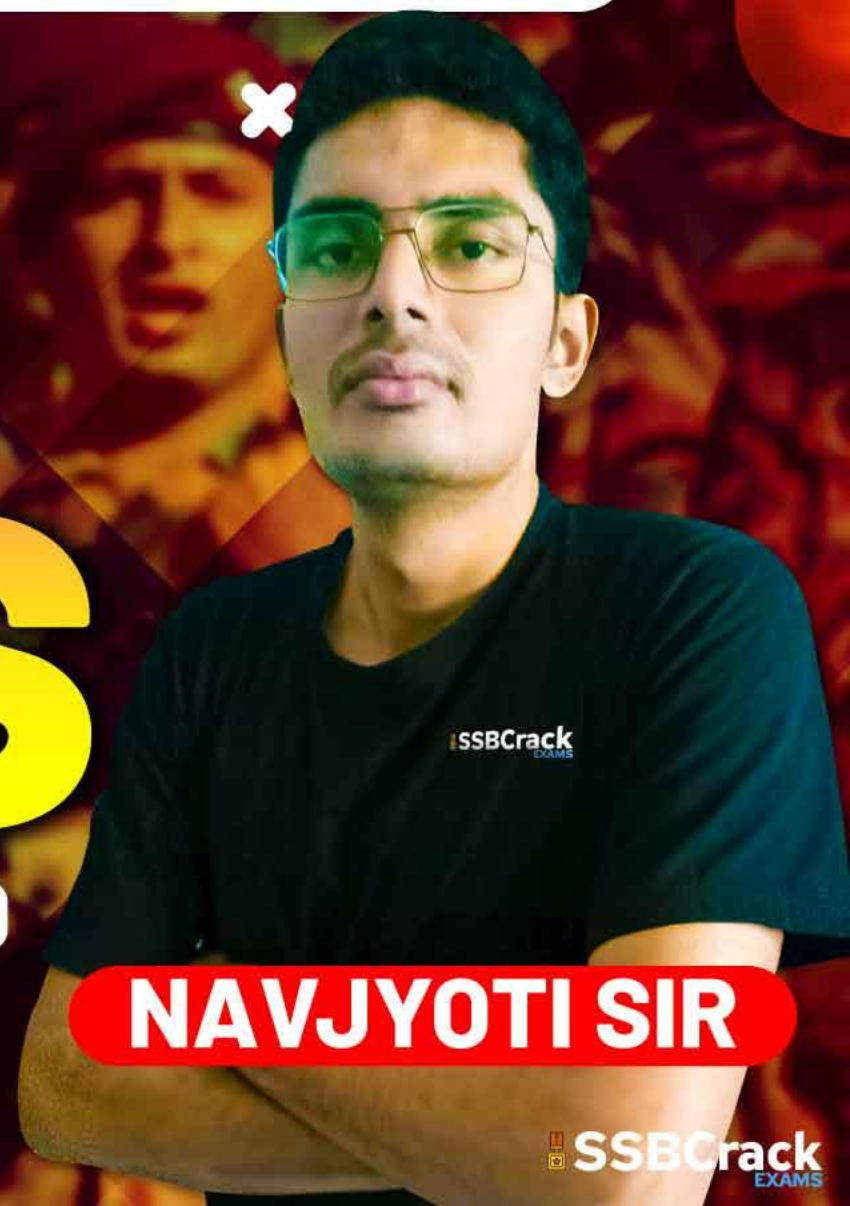
GS

LIVE

PHYSICS

HUMAN EYE & COLOURFUL WORLD

CLASS 2



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